

REMARKS

Claims 1-36 remain pending in the application. The specification and claims 1, 5, 14, 17, 25-27, 30, 33, and 36 have been amended without introduction of new matter. Favorable reconsideration in view of the above amendments and the following remarks is respectfully requested.

Claims 1-24 stand rejected under 35 U.S.C. §101 as allegedly not falling within one of the four statutory categories of invention. This rejection is respectfully traversed.

The Office's rejection is based on its assumption that the claimed steps are neither tied to another statutory category (such as a particular apparatus) nor transform underlying subject matter (such as an article of manufacture) to a different state or thing. Applicants respectfully disagree at least because independent claim 1 defines "A method of estimating interference in a terminal in a code division multiple access communication system ...", and independent claim 17 similarly defines "A method of searching for an empty channelization code m in a terminal in a code division multiple access communication system ..." (emphasis added). Thus, the claims clearly define a method that is tied to another one of the statutory categories by virtue of its being performed "in a terminal" (i.e., in a particular type of apparatus). For at least this reason, the claims are believed to define statutory subject matter under 35 U.S.C. §101.

Nonetheless, in order to expedite favorable prosecution, independent claims 1 and 17 have been amended to even more clearly define that it is "the terminal" that performs the recited steps.

For at least the foregoing reasons, claims 1-24 are believed to define statutory subject matter. It is therefore respectfully requested that the rejection of these claims under 35 U.S.C. §101 be withdrawn.

Claims 25-29, 33-35, and 36 stand rejected under 35 U.S.C. §101 as allegedly defining non-statutory subject matter.

The basis for the Office's assertion stems from the fact that, on page 14, lines 18-22 of the specification, the Applicants disclose: "the invention can additionally be considered to be embodied entirely within any form of computer-readable storage medium having stored therein an appropriate set of instructions for use by or in connection with an instruction-execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch instructions from a medium and execute the instructions." From this recitation, the Office concludes that the apparatuses defined by

independent claims 25 and 36 do not fall within one of the four statutory classes because “a program containing instructions would reasonably be interpreted by one of ordinary skill in the art as software *per se*....”

The relevance of the Office’s conclusion is not understood because neither of independent claims 25 and 36 defines merely “a program containing instructions”. Nor does the application text found at page 14, lines 18-22 state that the invention can be considered to be merely “a program containing instructions.” Rather, what is stated is “any form of computer-readable storage medium ***having stored therein*** an appropriate set of instructions....” It is well established that a computer-readable storage medium” falls within one of the four statutory classes. For at least this reason, claims 25-29 and 33-36 are believed to define statutory subject matter.

Nonetheless, in order to expedite favorable prosecution, independent claims 25 and 36 have each been amended to recite, *inter alia*, “controller circuitry ...” (emphasis added). Dependent claims 26, 27, 33, 36 have been similarly amended for compatibility with their base claims. Various types of circuitry embodiments are described in the specification at, for example, page 14, lines 14-17 (e.g., specialized circuits and/or one or more suitably programmed processors). It is believed that, as amended, the claimed “apparatuses” cannot reasonably be interpreted by one of ordinary skill in the art as comprising only software *per se*.

For at least the foregoing reasons, it is respectfully requested that the rejection of claims 25-29 and 33-36 under 35 U.S.C. §101 be withdrawn.

Claims 30-32 stand rejected under 35 U.S.C. §101 as allegedly defining non-statutory subject matter. This rejection is respectfully traversed.

Independent claim 30 defines a “computer-readable medium”. The basis for the Office’s rejection derives from the fact that the specification, at page 14, lines 22-31, recites “The term ‘machine readable medium’ can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction-execution system, apparatus, or device.” In the view of the Office, this “would reasonably be interpreted by one of ordinary skill in the art as a signal, *per se*,” which is non-statutory subject matter.

In response, the specification at page 14, lines 18-31, has been amended to cancel those portions that could be construed as defining a signal *per se*. Therefore, claims 30-32 are believed to define only tangible embodiments.

For at least the foregoing reasons, claims 30-32 are believed to define statutory subject matter. Therefore, it is respectfully requested that the rejection of these claims under 35 U.S.C. §101 be withdrawn.

Claims 1, 4-8, 15-16, 25, and 29 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Wang (US 20060154633) in view of Lin (US 20030142730). This rejection is respectfully traversed.

It is believed that the inclusion of claim 15 in the Office's stated list of claims subjected to this ground of rejection was made in error at least because claim 15 is not discussed in this part of the Office Action; thus, there is no support for such a rejection. This view is supported by the fact that claim 15 is specifically rejected based on a combination of Wang and Lin and further in view of Jokinen et al (US 6038238) (see below). The rejection of claim 15 is therefore traversed below in connection with that other ground of rejection.

The rejection of the remaining claims 1, 4-8, 16, 25, and 29 is traversed in the following.

The invention relates to methods and apparatuses for estimating interference in a terminal in a code division multiple access (CDMA) communication system, in which a pilot channel uses a scrambling code and the terminal uses an alternative scrambling code on a dedicated channel determined by a channelization code. As explained in the specification, beginning on page 3, line 22, good power control calls for the Signal-to-Interference Ratio (SIR) on the Dedicated Physical Channel (DPCH) to be estimated. The interference I, however, is typically estimated using pilot symbols transmitted on the Common Pilot Channel (CPICH), i.e., a channel with large signal strength, and then scaled to the DPCH interference. However, for reasons fully explained in the specification in the text spanning page 3, line 26 through page 6, line 19, this approach is deficient when alternative scrambling codes are used.

A conventional solution to this problem is to use the DPCH pilot symbols for both signal power (S) estimation and interference power (I) estimation, but this solution has problems. For example the I-estimate is noisy because the number of DPCH pilot symbols is small and the DPCH's overall signal power is small since the DPCH is power-controlled. The noisy I-estimate produces a noisy SIR estimate, and since the SIR estimate directly affects the average needed Base Station (BS) DPCH power, erroneously determining the average power due to the noisy SIR estimate can reduce the system capacity. (See Applicants' specification at page 6, lines 20-26.)

Embodiments defined by independent claims 1 and 25 address this problem. As now amended, claim 1 defines “A method of estimating interference in a terminal in a code division multiple access communication system, in which a pilot channel uses a scrambling code and the terminal uses an alternative scrambling code on a dedicated channel determined by a channelization code, comprising the steps of: the terminal determining whether the terminal knows of an empty channelization code m under the alternative scrambling code; if the empty channelization code m is known to the terminal, then the terminal using the empty channelization code m for estimating the interference; and if the empty channelization code m is not known to the terminal, then the terminal estimating the interference by determining a variance of symbols in at least two portions of the dedicated channel.” (Emphasis added.)

Independent claim 25 has been similarly amended.

Support for “determining whether the terminal knows of an empty channelization code m under the alternative scrambling code” can be found in the specification at, for example, page 10, lines 20-21 and in Figure 4, step 405.

The subject matter defined by independent claims 1 and 25 is believed to be patentably distinguishable over any combination of Wang and Lin at least because neither of those references discloses or suggests:

- “determining a variance of symbols in at least two portions of the dedicated channel.”
- A terminal that integrates two different interference estimation strategies into a single approach based on whether it is determined that the empty channelization code m is known to the terminal. (It is noted that the previous version of claims 1 and 25 also defined this integration of two interference estimation strategies into a single terminal, but that the Office ignored this feature in its rejection. Therefore, the present claim amendments are made merely to re-word the same feature in a way that shines a spotlight on this feature, so that the Office will pay more attention to it.)

It is respectfully contended that the Office’s analysis is deficient because it relies on a blanket statement that “Wang discloses all of the subject matter discussed above, but for specifically teaching determining an empty channelization code m under the alternative scrambling code. If an empty channelization code me is determined, using the empty channelization code m for estimating the interference.” (Emphasis added.) However, the only “subject matter *discussed above*” in the Office Action is subject matter found in the preamble of Applicants’ claims. Nowhere, for example, does the Office explain where Wang is believed to disclose “estimating the interference by determining a variance of symbols in at

least two portions of the dedicated channel” as recited in the body of the claims, or the defined combination of steps that are performed in the alternative based on whether the empty channelization code m is determined (or as now claimed, based on whether “the empty channelization code m is known to the terminal”).

It is respectfully asserted that Wang does not disclose these features, because the interference estimation technique involved in Wang is not believed to involve “determining a variance of symbols in at least two portions of the dedicated channel” as defined in Applicants’ claims, but rather involves the use of an empty channelization code. (See, e.g., Wang’s abstract.) Thus, not only is Wang deficient with respect to this feature, it is also deficient with respect to a combination that selects an interference estimation technique based on whether an empty channelization code m is known to the terminal.

The remaining part of the Office’s analysis is a reliance on Lin as showing the demodulation of a received signal using an empty code or Walsh channel. However, Lin is ultimately insufficient to support the rejection because it, too, is believed to lack any teaching or suggestion of “estimating the interference by determining a variance of symbols in at least two portions of the dedicated channel” as recited in the claims, or a combination of steps that are performed in the alternative based on whether the empty channelization code m is determined (or as now claimed, based on whether “the empty channelization code m is known to the terminal”). Thus, any combination of Wang with Lin would similarly lack these features.

For at least the foregoing reasons, the subject matter defined by independent claims 1 and 25 is believed to be patentably distinguishable over the prior art of record.

The various dependent claims 4-8, 16, and 29 inherit the features of their respective base claims 1 or 25, and are therefore patentably distinguishable for at least the same reasons as set forth above. Furthermore, these claims define additional features that are believed to be neither disclosed nor suggested by any combination of Wang and Lin.

For example, claim 6 defines the method “wherein the information of the empty channelization code m is included in a message sent to the terminal.” The Office supports this aspect of the rejection by arguing that Wang discloses this feature in figure 10 and page 4, paragraph 0052. It is respectfully asserted that the Office has mischaracterized Wang because the cited portions of Wang disclose merely that “a low SF idle channelization code from the OVSF tree [is selected] using information regarding occupied channelization codes.” However, not only does Wang’s arrangement not transmit the information regarding

empty channelization codes to the terminal, it would not do so because Wang's arrangement is specifically for enabling a base station to determine uplink interference estimation. (See, e.g., Wang at page 1, paragraph 0006.) Consistent with this purpose, Wang discloses a base station, not a terminal, performing the functions (see, e.g., Wang at page 3, paragraph 0043: "...the estimated SINR for the desired code channel can be calculated as illustrated by the arrangement of FIG. 7, which illustrates the parts of a base station that are essential for explaining this exemplary embodiment of the present invention.") Moreover, Wang states that "The idle channelization code has been selected by an idle code selection block 28 based on the OVSF code tree in FIG. 2 and occupied codes known to the base station." (Emphasis added.)

Thus, in Wang, it is the base station that utilizes the empty code for interference estimation, and it is the base station that has knowledge of which codes are empty and which are used, so there is no need to communicate this information in a message. Further, the terminal (mobile station) would have no need for this information since Wang's process is carried out in the base station.

For at least the foregoing reasons, it is respectfully asserted that the subject matter variously defined by independent claims 1 and 25, as well as by their various dependent claims 4-8, 16, and 29 is patentably distinguishable over the prior art of record. Accordingly, it is respectfully requested that the rejection of these claims under 35 U.S.C. §103(a) be withdrawn.

Claims 2-3, 15, and 26 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Wang in view of Lin and further in view of Jokinen et al. (US 6038238 -- henceforth "Jokinen"). This rejection is respectfully traversed.

Claims 2-3, 15, and 26 variously depend from independent claims 1 and 25, and are therefore patentably distinguishable over any combination of the Wang and Lin documents for at least the reasons set forth above. Jokinen fails to make up for the deficiencies of Wang and Lin, so that any combination of these three would still lack at least:

- "estimating the interference by determining a variance of symbols in at least two portions of the dedicated channel."
- A terminal that integrates two different interference estimation strategies into a single approach based on whether it is determined that the empty channelization code m is known to the terminal.

Further, the Office acknowledges that Wang and Lin fail to disclose determining whether the communication system is using discontinuous transmission (DTX), but relies on Jokinen as making up for this deficiency. In this respect, the Office argues that “Jokinen et al. ... discloses in (fig. 4), a method to realize discontinuous transmission (DTX) in a telecommunications network (col. 5, lines 20-36)” and that it would have been obvious “to have utilized the method of Jokinen et al in the method of Wang as modified by Lin .. to reduce co-channel interference and its effect on the communication quality (col. 1, lines 16-18).”

It is respectfully asserted that the Office’s argument does not support its rejection because it merely states that one would use DTX while at the same time performing interference estimation.

However, Applicants’ claims do not define using DTX. Rather, they qualify the claimed method of interference estimation by stating that “determining the variance of symbols in at least two portions of the dedicated channel is performed only after first determining that the communication system is not using discontinuous transmission (DTX).” (Emphasis added.) Support for this feature can be found in the specification at, for example, Figure 4, steps 413 and 417 (in which both DPCCH and DPDCH are used only when DTX mode is not in use).

Jokinen is silent with respect to interference estimation, and therefore cannot suggest a terminal basing its interference estimation technique on whether DTX is in use. Wang and Lin’s interference techniques involving unused channelization codes have no need for knowledge of whether DTX is in use.

For at least the foregoing reasons, it is respectfully asserted that the subject matter defined by claims 2-3, 15, and 26 is patentably distinguishable over the prior art of record. Accordingly, it is respectfully requested that the rejection of these claims under 35 U.S.C. §103(a) be withdrawn.

Claims 30-32 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Wang in view of Lin and further in views of Langberg et al. (US 5852630 -- henceforth “Langberg”). This rejection is respectfully traversed.

Independent claim 30 has been amended in a similar way as independent claim 1, so that it now defines:

A computer-readable medium containing a computer program for estimating interference in a terminal in a code division multiple access communication system, in which a pilot channel uses a scrambling code and the terminal uses an alternative scrambling code on a dedicated channel determined by a channelization code, wherein the computer program performs the steps of:

determining whether the terminal knows of an empty channelization code m under the alternative scrambling code;

if the empty channelization code m is known to the terminal, then using the empty channelization code m for estimating the interference; and

if the empty channelization code m is not known to the terminal, then estimating the interference by determining a variance of symbols in at least two portions of the dedicated channel.

It is noted that the steps performed by claim 30's computer program embodied on the computer-readable medium correspond to those defined by method claim 1. Therefore, the subject matter defined by claim 30 is patentably distinguishable over any combination of Wang and Lin for at least the same reasons as those set forth above. Langberg fails to make up for the deficiencies of Wang and Lin, so that any combination of these three documents would still lack at least:

- “estimating the interference by determining a variance of symbols in at least two portions of the dedicated channel.”
- A terminal that integrates two different interference estimation strategies into a single approach based on whether it is determined that the empty channelization code m is known to the terminal.

Langberg discloses a method and apparatus for a RADSL Transceiver warm start activation procedure with precoding, and has nothing to do with interference estimation. The Office does not argue to the contrary, but merely relies on Langberg for its teaching that “the method and apparatus ... can be implemented in software stored in a computer-readable medium.”

For at least the foregoing reasons, it is respectfully asserted that the subject matter defined by independent claim 30 and its dependent claims 31-32 is patentably distinguishable

over the prior art of record. Accordingly, it is respectfully requested that the rejection of these claims under 35 U.S.C. §103(a) be withdrawn.

The application is believed to be in condition for allowance. Entry of the proposed amendments and prompt notice of allowance are respectfully requested.

Respectfully submitted,
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